EXHIBIT B

CLEANUP ACTION PLAN (CAP)

GATX TERMINAL CORPORATION HARBOR ISLAND

Seattle, Washington

November 2, 1999

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1.0 INTRODUCTION

This Cleanup Action Plan (CAP) is provided to describe the proposed remediation at the GATX Harbor Island Terminal (Terminal) located in Seattle, Washington. It has been prepared to satisfy the requirements of the Model Toxics Control Act (MTCA) Agreed Order No. DE 92 TC-N159, cooperatively entered into between the former owner, SHELL Oil and the Washington State Department of Ecology (Ecology) and to implement the Consent Decree between Ecology and GATX Terminals Corporation (GATX). GATX acquired the site from SHELL Oil in 1994.

The purposes of this CAP are to: 1) describe the site, including a summary of its history and extent of contamination; 2) identify the site-specific cleanup standards, 3) summarize the remedial cleanup action alternatives presented in the Focused Feasibility Studies (FFS), 4) identify and describe the selected remedial action alternative for the site and 5) discuss the implementation schedule. Detailed information regarding site history, characterization, and the evaluation of alternative cleanup actions is contained in the final RI and final FFS reports [Pacific Environmental Group, Inc., 1994, 1997].

The remedial actions selected for the site are to occur under the legal framework of a Consent Decree between GATX and Ecology.

2.0 SUMMARY OF SITE CONDITIONS & INTERIM REMEDIATION SYSTEM

This section provides a summary of site conditions, including the nature and extent of impacts and a description of interim remediation system conducted on the site. In addition, the exposure pathways identified for the site are briefly described.

2.1 Site

The GATX Harbor Island Terminal is located at 2720 13th Avenue Southwest in Seattle, Washington (Figure 1) and is part of a U.S. EPA Superfund Site, the Terminal Operable Unit. The facility, approximately 14 acres in size, is located in the highly industrialized north-central

section of Harbor Island and was owned and operated by Shell since 1944. In December 1994, GATX purchased the Terminal from Shell and currently manages all facility operations. The Terminal is situated on relatively level property, with surface elevations ranging between 6 to 11 feet above sea level. There are no surface water bodies on the Terminal property boundaries. The site is situated approximately 1,400 feet from the West Waterway and over 1000 feet from the East Waterway. The site is zoned industrial and meets the industrial criteria established under WAC 173-340-745. It is likely that the site will remain an industrial facility and a Superfund Site in the foreseeable future. Ecology and EPA have determined that there is no current or planned future use of groundwater beneath Harbor Island for drinking water purposes.

The Terminal is presently divided into five distinct areas (Figure 2). These areas include the A, B, C, D, and E Yards. The A Yard contains two fuel tanker truck-loading racks. The administrative office and maintenance building is also situated in the A Yard. The A Yard is entirely paved with asphalt or concrete. The A Yard is bounded by a containment dike for the B Yard on the north and by chain-link fencing on the south, east, and west.

The B and C Yards are used as bulk fuel storage areas. Fifteen above ground storage tanks are located within the B Yard and six are situated within the C Yard. Both yards are mostly unpaved and are surrounded by concrete containment dikes.

The D Yard is situated between the B and C Yards and has been used to route product and utility lines. Several maintenance buildings and material handling areas are also situated within the D Yard. The partially paved yard is enclosed to the north and south by concrete dikes from the B and C Yards and is fenced on the east and west sides.

The E Yard once served as a fuel loading rack facility. This yard is currently leased to Chevron Oil Company and is partially paved. Terminal operations commenced in 1944 when tanks in the B Yard were installed. Tanks in the C Yard were subsequently constructed in 1951. A loading rack was once situated in the E Yard. This rack and associated piping were removed in 1992. Shell leased the A Yard from the Port of Seattle (Port) in 1979 and constructed two fuel tanker truck loading racks. The loading racks remain in use by GATX today.

The Terminal is situated on the southeast portion of a groundwater mound that is centered on the northern half of Harbor Island. Groundwater migration is south, southeast and southwest across the site. The predominant groundwater flow direction is toward the southeast. The primary groundwater discharge point is the Duwamish River, East and West Waterways. Due to the dampening effect of the bulkhead structures along the East and West Waterways of the Duwamish River, and the inland location of the site which is at the center of the Island, water table fluctuations in response to tidal influence and seasonal fluctuations is less than 1 feet at the site.

2.1.1 Nature and Extent

The following section summarizes the nature and extent of contamination at the site based on the results of the RI and FFS. A general discussion of the contaminants detected at the site is presented first. A summary of the floating product or product (defined as a separate phase, mobile petroleum hydrocarbon compounds) plume beneath the A and C Yards is presented next since this and the surface soils impacts of lead and arsenic are the primary areas of concerns at the site. Sections on total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene compounds (BTEX) follow.

The primary constituents of concern encountered in the subsurface soil beneath the Terminal are TPH-G, TPH-D, and TPH-O. Elevated TPH concentrations exist in four general areas: (1) the southern portion of the B Yard, (2) the northern portion of the A Yard, (3) the southern half of the C Yard, and (4) the area between Tanks 39 and 42 in the C Yard.

The inorganic metals, arsenic and lead are present throughout the C and B Yards on the surface soils and in the groundwater and are likely due to historical air stack emissions from an offsite smelter.

Within the C Yard, TPH-gasoline and benzene are also primary contaminants of concern in the surface soil. GATX conducted an aggressive interim action in 1996 and early 1997 to contain and remove the floating product and dissolved petroleum hydrocarbons from beneath the site resulting from the December 1996 release. Approximately, 7,200 gallons of product, and 142,497 gallons of contaminated groundwater were recovered from the subsurface, recycled (for the product), and treated (the dissolved petroleum hydrocarbons), before disposal.

The results of the site characterization activities conducted during the RI indicate that contaminants present in soil and groundwater at the site are primarily freshly spilled gasoline (estimated 48,000 gallons, December 1996). The spill is mixed with highly weathered total petroleum hydrocarbons as diesel (TPH-D) with lesser amounts of weathered gasoline (TPH-G) and heavier oil (TPH-O), and inorganic metals (arsenic and lead). The weathered TPH is most likely the result of historic spills at the site.

Floating Product. The presence of floating product is limited to seven areas in the A Yard, one area in the B Yard. In January 1997, the thickness of floating product present in the A yard, ranged from 0.01 to 0.48 feet. Product observed in the B Yard ranged in thickness from 0.14 to 1.60 feet (Wells 12 and 15) during this period. The thickness of measurable product in the C Yard ranged from 0.11 to 1.20 feet in December 1996. In February 1997, measurable amounts of product in the C Yard had decreased since the implementation of the

interim action and it ranged, in thickness from 0.01 to 0.23 feet. The interim action was discontinued in April 1997. In May 1998, no free product was observed in the C Yard.

The result of the Supplemental Investigation of the C Yard Fuel Spill indicate that approximately 7,200 gallons of gasoline was initially recovered from the ground surface, and about 4,900 gallons was recovered from the water table. The remainder of the spill probably volatilized directly into the atmosphere or adsorbed in soil. The proposed remedial action alternatives presented in this CAP is intended to address this and other petroleum hydrocarbon contamination at the site.

Arsenic and Lead. Arsenic and Lead were found in surface soils throughout B and C Yards, and portions of D, and E, Yards of the tank farms above Harbor Island action levels (lead 1000- mg/kg, arsenic - 32.6 mg/kg) set in the EPA ROD for the surface soils. These action levels are based on a risk assessment conducted by EPA. EPA conducted surface soil investigations for the island including the GATX site. Ecology and EPA in a memorandum of agreement (MOA) agreed not to duplicate investigation efforts on the island except where data gaps exist. In 1994, Ecology concurred with the EPA ROD on Harbor Island.

The lateral distribution of lead appears to be relatively uniform across the B and C Yards. Lead concentrations decrease rapidly at depth to less than 100 parts per million (ppm) at 1.5 feet below grade. At depths below 1.5 feet, total lead concentrations in soil were below 51 ppm. The occurrence of lead is most likely associated with stack emissions from an offsite former lead smelter located south of the GATX site.

Total lead in the groundwater was detected in 18 of the 24 groundwater samples analyzed (75%), while dissolved lead was detected in 2 of the 11 groundwater samples analyzed (18%). Arsenic was detected in 4 of the 10 groundwater samples analyzed (40%). Arsenic and lead are the only metals detected in groundwater above cleanup levels during the RI monitoring. Dissolved copper, arsenic and lead were also detected across much of the northern portion of Harbor Island during the USEPA RI, indicating elevated background concentrations. These inorganic metals are associated with the former lead smelter and marine paints used at shipbuilding and repair facilities adjacent to the Texaco Terminal (Tetra Tech 1988).

TPH and BTEX. RI data also indicate that elevated concentrations of TPH are present in the subsurface soils. The primary constituents of concern encountered in the subsurface soil beneath the Terminal are TPH-G, TPH-D, and TPH-O. Of the soil samples analyzed for the site, distribution of detected total TPH are: 19% contained TPH-G, 42% contained TPH-D, and 39% contained TPH-O. Elevated TPH concentrations exist in four general areas: (1) the south portion of the B Yard, (2) the northern portion of the A Yard, (3) the area adjacent to Tank 44 situated in the southeast portion of the C Yard, and (4) the area between Tank 39 and 42 in the C Yard. These findings tend to correlate with documented releases from above-ground tanks in the B and C Yards (Hart Crowser, 1992).

It is suspected that the primary potential source areas for TPH observed within the A, Yard include a former oil-water separator, a former loading rack, a former UST that previously stored diesel, and a portion of an old vapor recovery system. All of these facilities have ceased operation and have been removed or decommissioned. The vertical migration of TPH in soil is limited because of the shallow depth to groundwater. In most cases, TPH concentrations are highest at the groundwater table interface. However, the Supplemental RI data show that a resulting "smear" zone of product in soil beneath the product plume has been detected up to 4 feet below the water table.

The primary dissolved contaminants observed in groundwater include TPH-G, TPH-D, TPH-O, and benzene. The extent of dissolved TPH-G in groundwater is generally limited to the northern, western and southern portions of the A Yard, the southwest portion of the B Yard, and the southern and southeastern portions of the C Yard. This observation concurs with past gasoline usage and storage practices at the Terminal.

Of the groundwater samples analyzed for the site, distribution of detected dissolved total petroleum hydrocarbons are: 30% contained TPH-G, 52% contained TPH-D, and 18% contained TPH-O. Relatively uniform concentrations of TPH-D were observed in groundwater from wells in the C, D, and E Yards, slightly elevated concentrations of TPH-D (2 to 13 ppm) were detected in the B Yard and are likely due to the presence of separate phase hydrocarbons in this area. Benzene was detected in 10 of the 22 groundwater samples analyzed (45%).

Fate and transport groundwater modeling conducted for the tank farms show that constituents of the dissolved petroleum hydrocarbons (e.g., benzene) do not pose a threat at the shorelines of the East and West Waterways of the Duwamish River. Therefore the primary concern at the site are potential surface runoffs from surface soils to surface water, infiltration, and potential airborne particulate exposure to day workers. Offsite migration of these contaminants in the subsurface is a secondary concern at the site.

Marine Sediments. GATX site is situated at the middle of the island and has no direct marine sediment or shorelines next to its property boundaries.

2.1.2 Exposure Pathways

The following pathways were evaluated at the site as part of the FFS (Pacific Environmental Group, Inc. 1997):

- Product to Groundwater and Surface Water
- Soil to Groundwater
- In-land Groundwater to Surface Water
- Soil Particulate to Air
- Soil Direct Contact

- Groundwater to Marine Sediments

As described in the following sections, the primary exposure pathways of concern identified for the site are associated with the product plume (Section 2.1.2.1), lead and arsenic particulate in surface soil (Section 2.1.2.4.). Secondary exposure pathways identified for the site are associated with the subsurface soil in the A, B, and C Yards (Section 2.1.2.2).

2.1.2.1 Product to Groundwater and Surface Water Pathway

The two potential transport pathways associated with product plume beneath the site include; (1) migration of vapors to nearby structures and offices, (2) and partitioning of hydrocarbons from the product or adjacent soil to the groundwater, and then subsequent transport in dissolved phase to the surface water through groundwater discharges. These pathways associated with the product plume are the primary and secondary pathways of concern because they pose a potential threat to the surface water and its ecosystem. The proposed cleanup action will interrupt these pathways, which will focus on removal of the product, dissolved petroleum hydrocarbons, and vapors as discussed in Section 4. These actions will be effective in meeting cleanup levels in groundwater at the point of compliance, providing protection to day workers or nearby offices from fumes and vapors, and preventing potential migration of product sheen and dissolved petroleum hydrocarbon plumes into the surface water at the island edges.

2.1.2.2 Soil to Groundwater Pathway

The results of groundwater monitoring data and interim remediation conducted during the RI and FFS indicate that gasoline constituents are adsorbed in the soil from the recent spill. Groundwater monitoring data indicate that the dissolved plumes associated with these sources have not reached apparent equilibrium with the soils. However, the results of the fate and transport modeling of the petroleum hydrocarbon constituent, benzene, partitioned in the groundwater shows that the groundwater pathway at the GATX site does not pose a threat to the surface water at the shorelines. However, groundwater monitoring shows that offsite migration to adjacent properties is viable and it is a secondary concern at the site.

The soil to groundwater pathway from the inland portions of Harbor Island where the site is located does not pose a threat to the surface water at the shorelines based on the results of the fate and transport modeling and groundwater monitoring for the site. Therefore, offsite migration to adjacent properties is considered a secondary concern. Accessible TPH contaminated soil hot spots that are ongoing sources of groundwater contamination will be excavated to the extent practicable. This excavation will be based on the action levels of 10,000 mg/kg for the C Yard where the recent spill of 1996 occurred and 20,000 mg/kg for the rest of the site. The 10,000 mg/kg action level was selected in the U.S. EPA ROD for TPH hot spots on Harbor Island. The 20,000 mg/kg action level is the EPA (A Guide to

Corrective Action, EPA, May 1995) recommended lower threshold criteria to enable natural attenuation to successfully reduce total petroleum hydrocarbons concentrations in soils to acceptable levels within a reasonable restoration time period.

Excavation of accessible TPH soil hot spots that are ongoing sources of groundwater contamination will be performed so that the dissolved petroleum hydrocarbon in groundwater does not adversely impact off-site properties. This hot-spot remediation is being performed to improve groundwater general conditions at the source and to enhance the timely restoration of the impacted area through natural degradation. Monitoring wells will be sampled along the property boundaries as part of the Groundwater Compliance Monitoring Program to provide early warning of any potential off property migration. A detailed contingency plan is outlined in the compliance groundwater monitoring program for the site as a 'backup' remediation technology in case the Preferred Corrective Option proves ineffective.

2.1.2.3 Inland Groundwater to Surface Water Pathway

The results of groundwater analytical modeling conducted during the FFS indicate that the dissolved-phase hydrocarbon plumes originating inland within the site will not reach Elliott Bay or the Duwamish River at concentrations above surface water cleanup levels. Continued groundwater monitoring will be conducted as part of the cleanup action to verify protection of Elliott Bay and the Duwamish River.

The selected remedy for groundwater combines several remedial elements to meet the remedial action objectives of removing petroleum vapors, product and the dissolved petroleum hydrocarbons including residual hydrocarbons below the water table within and along the property boundaries. These elements are discussed in detail in Section 4.1.

The selected remedial technologies will enhance and expedite the natural biodegradation of the residual TPH. The effectiveness of these actions to interrupt groundwater to surface water pathway for the protection of human health and the surface water will be verified through the groundwater compliance monitoring program, Exhibit F, for the site. If groundwater contaminant concentrations attributed to the Terminal are confirmed above appropriate state and federal standards, the contingency plan outlined in this CAP will be implemented. The final remedial design for the implementation of these technologies will be conducted under the legal framework of the Consent Decree.

2.1.2.4 Soil Particulate to Air Pathway

This pathway is of concern for TPH because TPH-impacted soil is located at or near ground surface comprising mostly of fresh gasoline associated with the 1996 release. The surface areas of impact in this location are limited to the C Yard. During the remedial design phase,

additional surface soil data will be collected for TPH-G to evaluate if soil particulate to air pathway is still a concern at the C Yard.

EPA ROD for surface soils on Harbor Island requires 3 inches of asphalt cap on areas of Harbor Island that exceed 32.6 mg/kg, arsenic and 1000.0 mg/kg, lead based on a risk assessment conducted during the EPA RI.

The results of the EPA RI surface soil lead and arsenic analyses for the GATX site indicate that the soil particulate to air pathway is of primary concern for the B and C Yards, and portions of the D and E Yards, where lead and arsenic levels exceed Harbor Island action levels. Ecology concurs with EPA that this is a concern because the gravel cover may not provide adequate protection from groundwater infiltration, air particulate exposure to day workers, leaching, and some surface runoff discharges.

The proposed cleanup action for this pathway includes excavation or capping of accessible areas of the site that exceed lead and arsenic action levels. If capping is selected, 3 inches of asphalt or its equivalent of Portland Cement fixation will be implemented, followed with a TCLP test to ensure that the fixation is complete. This is will effectively eliminate the soil to air pathway, surface soil to groundwater infiltration, and subsequent runoffs as discussed in Section 4.

2.1.2.5 Soil Direct Contact Pathway

The capping or excavation of the affected surface soil areas of the C and B Yards will effectively address the soil direct contact pathway for areas impacted by the recent spill, arsenic and lead. Additional protection will be provided through the restrictive and deed covenant on the property and institutional controls.

2.1.2.6 Groundwater to Marine Sediments Pathway

This pathway is not of concern based on the results of the fate and transport modeling conducted at site. However, groundwater-monitoring wells will be sampled along the property boundaries as described in the Groundwater Compliance Monitoring Program, Exhibit F, developed for the site. This is to ensure continued protection of the surface water and monitor plume concentrations dissolved in groundwater within property boundaries.

2.2 INTERIM REMEDIATION

Interim actions were recently (December 1996 through April 1997), implemented at the site due to the estimated 48,000 spill of gasoline in the C, Yard. The result of the Supplemental Investigation of the C Yard Fuel Spill indicate that approximately 7,200 gallons of gasoline

were initially recovered from the ground surface and about 4,900 gallons was recovered from the water table. The remainder of the spill probably volatilized directly into the atmosphere or is adsorbed in soil. This means that part of the fuel spill may remain in the soil and could be released through volatilization, in a dissolved phase, and as separate phase hydrocarbon. Three groundwater sampling events were completed during the interim actions. Detected concentrations of TPH-gasoline dissolved in the groundwater ranged from non-detect to 79,600 ppb (79.6 mg/l), while benzene ranged from non-detect to 11,800 ppb (11.8 mg/l). Cut-off trenches and dual phase extraction wells for remote and active extraction of product and groundwater were used on site to contain the spill to manageable conditions pending final remedies in the CAP. Additional remediation for the GATX site is proposed in this CAP.

3.0 SUMMARY OF CLEANUP STANDARDS

The Model Toxics Control Act (MTCA) cleanup regulations provide that a cleanup action must comply with cleanup levels for selected hazardous substances, points of compliance (POCs), and applicable or relevant and appropriate state and federal laws (ARARs) [Washington Administrative Code (WAC) 173-340-710]. The final indicator hazardous substances identified for the site, the associated cleanup levels, and ARARs are briefly summarized in the following sections. POCs are outlined in the Groundwater Compliance Monitoring Plan.

3.1 Indicator Hazardous Substances

Indicator hazardous substances (IHSs) were identified for the GATX Harbor Island Terminal site as part of the FFS using the criteria outlined in WAC 173-340-708(2). The final list of IHSs for groundwater and soil are a subset of the contaminants detected at the site. The final soil IHSs are TPH compounds, arsenic and lead for surface soil; and benzene, ethylbenzene, toluene, xylenes, TPH-gasoline, TPH-diesel, and TPH-oil for subsurface soil. The final groundwater IHSs are benzene, toluene, ethylbenzene, xylenes, TPH-gasoline, TPH-diesel, TPH-oil, arsenic, lead, and free product.

3.2 Cleanup Levels

Soil and groundwater cleanup levels for the final IHSs were developed based on the industrial zoning of the site and the determination by Ecology that there is no current or planned future use of the groundwater for drinking water purposes. The beneficial use of the site groundwater is the protection of the adjacent surface waters and its ecosystems and to prevent dissolved petroleum hydrocarbon elevated plume concentrations in groundwater from migrating off site and adversely impacting adjacent properties.

Surface soil (0 – 6 “) cleanup levels were determined based on the EPA ROD for Harbor Island. Ecology concurred with EPA’s ROD in 1994. These criteria are:

Arsenic	32.6 mg/kg
Lead	1,000 mg/kg

Surface soil cleanup levels for BTEX and TPH were not developed because the capping or excavation of the affected surface soil areas of the C and B Yards, will effectively address the soil direct contact pathway for areas impacted by the recent petroleum hydrocarbon spill.

The fate and transport modeling of the dissolved petroleum constituents (benzene) associated with the in-land subsurface TPH soils show that the dissolved petroleum constituents do not pose a threat to the surface water at the shorelines.

The subsurface soil action level for TPH is therefore a secondary concern, and it is set to meet the remedial action objective of protecting surface water at the property boundaries by improving general groundwater conditions at the source, and by enhancing restoration of the impacted area through natural biodegradation.

The subsurface soil action level for TPH at the C Yard associated with the spill of 1996 is:

Total TPH	10,000 mg/kg

This action level set forth in the EPA ROD for TPH on Harbor Island.

The subsurface soil action level for TPH for the rest of the site is:

Total TPH	20,000 mg/kg

This action level is the EPA (A Guide to Corrective Action, EPA, May 1995) recommended lower threshold criteria to enable natural attenuation to successfully reduce total petroleum hydrocarbons concentrations in soils to acceptable levels within a reasonable restoration time period. These TPH action levels are also protective for other chemical constituents in petroleum product (i.e., BTEX).

Groundwater cleanup levels were determined by Ecology to be surface water standards that are protective of aquatic organisms in Elliott Bay. These surface water standards are the adopted ambient water quality criteria (WAC 173-201A and Section 304 of the federal Clean Water Act). The category of ambient water quality standards selected as relevant and

appropriate for the site are the chronic criteria for protection of aquatic organisms (WAC 173-201A-040). Surface water standards are not established for TPH; therefore, the groundwater cleanup levels for TPH-G, TPH-D, and TPH-O were selected as protective cleanup goals at this time and they are:

Product	No Sheen
Benzene	0.071 mg/L
Ethylbenzene	29.0 mg/L
Lead	0.0058 mg/L
Toluene	200.0 mg/L
TPH-G	1.0 mg/L
TPH-D	10 mg/L
TPH-O	10 mg/L

Dissolved lead in groundwater beneath Harbor Island is attributed to offsite sources (former lead smelter).

3.3 ARARS

The selected cleanup action will comply with federal, state and local ARARs. Applicable requirements are federal and state laws or regulations that legally apply to a hazardous substance, cleanup action, location, or other circumstance at the site. Relevant and appropriate requirements are those federal and state regulations that do not legally apply but address situations sufficiently similar that they may warrant application to the cleanup action. Potential ARARs pertinent to remediation alternatives include substantive requirements of chapters 70.94, 70.95, 70.105, 75.20, 90.48, and 90.58 RCW. Others are identified and defined in the FFS (Pacific Environmental Group, Inc. 1997) and they include the Model Toxics Control Act (WAC 173-340), the Washington State Dangerous Waste Regulations (WAC 173-303, Washington State Water Quality Standards for Surface Water (WAC 173-201A), and laws requiring or authorizing local government permits or approvals for the remedial action implementation.

4.0 SUMMARY OF SELECTED CLEANUP ACTION ALTERNATIVES

Site-specific cleanup action alternatives were developed and analyzed for soil and groundwater in the final FFS (Pacific Environmental Group, Inc. 1997) to ensure the protection of human health and the environment at the site. Based on this initial screening and evaluation of supplemental data collected during the FFS, the following alternatives were selected for further evaluation. Part of the remedy selection included the development of estimated costs for each cleanup action alternative. These cost estimates have been reviewed by Ecology as part of the remedy selection process.

- **Alternative 1 - No Further Action.** This alternative includes cleanup actions performed at the Terminal to date, groundwater monitoring as part of the island-wide operable unit, passive product recovery, and completed interim actions.
- **Alternative 2** - In-situ Treatment of Soils that may include:
    - **2A** Soil Vapor Extraction (SVE)
    - **2B** Soil Flushing
    - **2C** Air Sparging
    - **2D** Natural Attenuation/Intrinsic Biodegradation
- **Alternative 3** - Soil Excavation and Treatment or Disposal
- **Alternative 4** - Surface Soil Capping with Asphalt or Membrane Fixation
- **Alternative 5** - Active and Passive Product Recovery
- **Alternative 6** - Groundwater Monitoring

4.1 Proposed Cleanup Alternatives

The proposed cleanup action for the site was selected based on a comparison of each cleanup action alternative with the following criteria (WAC 173-340-360(2) and (3)) and consideration of the MTCA remedy selection requirements:

- Overall Protection of Human Health and the Environment
- Compliance with Cleanup Standards
- Use of Permanent Solutions to the Maximum Extent Practicable
- Compliance with ARARs
- Provision for Compliance Monitoring
- Provision for Reasonable Restoration Time Frame

THE PROPOSED CLEANUP ALTERNATIVES ARE: 2A, 2C, 2D, 3, 4, 5, & 6.

Detailed descriptions of each alternative with engineering drawings, specifications and justifications will be presented in the Remedial Design phase for the site. A conceptual description of each element and how it will be implemented at the site is presented below:

Surface Soil

- 3 inches Asphalt Capping or its Equivalent of Portland Cement Soil Fixation followed with TCLP testing to ensure that fixation is complete.
- Soil excavation and disposal

Subsurface Soil

- Excavation of Accessible TPH hot spots to the extent practicable and disposal/treatment
- Natural/Intrinsic Biodegradation of residual contaminated soils
- Soil vapor extraction

Groundwater

- Dual-phase extraction of groundwater and product or extraction of product and groundwater separately
- Air Sparging

Floating Product

- Active and passive point-source extraction
- Partially-penetrating down-gradient vertical barrier to stop product migration
- Combinations of the above options

This group of proven technologies will be implemented at the GATX site as necessary to meet all site cleanup criteria. Detailed descriptions and evaluations with engineering drawings, specifications and justifications will be presented in the Remedial Design document that GATX will prepare for the site. The following is a detailed conceptual discussion of the preferred remedial action alternatives proposed for the site.

Surface Soil:

Asphalt Cap/Soil Fixation. The preferred remedial alternative for addressing lead and arsenic impacted surface soils may include placing a cap of asphalt (3 inches) or its equivalent of on-site fixation by incorporating the soils into Portland-cement concrete (Figure 2). This will be accomplished by excavating those areas that exceed surface soils action levels to a

depth of 6 inches. The excavated soils which are primarily fine sands, will then be fixated and placed on site with an imported Portland-cement concrete which will utilize the sandy soils matrix to form a binding aggregate.

The existing data indicates that approximately 70% of the surface soils in the C Yard, and 40% of the surface soils in the B Yard, may need to be remediated. Before excavation or capping/fixation is begun, additional soil sampling (Supplemental Studies), will be performed to refine the boundaries between soils which are above and below action levels for lead and arsenic. Once precise boundaries are identified, surface soils will be excavated, capped, or incorporated into concrete using standard concrete-mixing equipment. Samples of the resulting concrete will be tested by the TCLP method to confirm that immobilization of the contaminants of concern are complete. This proposed alternative will effectively address the surface to groundwater infiltration, and leaching pathways, direct contact for site workers and surface runoffs.

Subsurface Soil:

Soil Vapor Extraction (SVE) and Natural Biodegradation. Remedial Alternative 2D, 3 and 6, (SVE, excavation of accessible TPH hot spots to the extent technically practicable, institutional controls and degradation of organic contaminants by intrinsic bioremediation/natural attenuation) has been selected for the subsurface site soils to ensure continued protection for the future. To ensure and document that the primary and the secondary concerns for the site are met (continued protection of the surface water and its ecosystem, and containment of plumes within property boundaries), groundwater monitoring will be implemented to monitor the ongoing intrinsic degradation/natural attenuation of TPH in soils as part of the selected cleanup action. A deed restriction will also be implemented to prevent inappropriate future use of the site (Exhibit D).

The proposed cleanup action is conceptually designed to remove volatile hydrocarbons from the vadose zone beneath the site to prevent vapor migrations to offices and secondary structures. This technology will be used as needed when appropriate to ensure that the soil vapor to air pathway is interrupted in areas where a hazard exists. The SVE system will also maintain elevated oxygen concentrations within the vadose zone. Operation of the SVE and other technology based applications and systems in this proposed CAP will be discontinued through performance, cleanup and technology standards evaluations as part of the Compliance Monitoring Program to be developed for the site. Details of the criteria and frequency for such evaluations for discontinuing the SVE and other technology based applications and systems for the site will be developed as part of the compliance-monitoring program for the GATX site.

Excavation & Location of Accessible Impacted Soils and Volumes.

A Yard:

Upon successful completion of the free product removal from the Yard A, a subsurface TPH soil confirmation analytical sampling will be conducted north of A-29 and northwest of A-22, which is northwest and southwest of the Garage Building in the A Yard. TPH hot spots up to 20,000 mg/kg are detected to be present at these locations. If the analytical results of the TPH subsurface soil confirmation sampling confirm TPH hot spots are present at these locations, excavation of the accessible TPH hot spots using the 20,000 mg/kg action levels in the, A Yard subsurface soils will be implemented to the extent technically practicable (Figure 3).

B Yard:

Excavate to the extent technically practicable, accessible TPH hot spots using the action levels of 20,000 mg/kg in the B Yard subsurface soils affected by historical spills without undermining the integrity of the tanks next to the excavation areas. The two TPH hot spots designated for excavation to the extent technically practicable in the B Yard subsurface soil are, 1) SS-28, which is located between tanks 18 and 21, 2) SS-9, which is located southwest of tank 22. (Figure 3). The total volume of the accessible TPH subsurface soil hot spots subject to excavation to the extent practicable in Yard B is approximately, 380 cubic yards.

C Yard:

Excavate to the extent technically practicable, accessible TPH hot spots using the action levels of 10,000 mg/kg in the C Yard subsurface soils affected by the recent spill without undermining the integrity of the tanks next to the excavation areas. The seven TPH hot spots designated for excavation to the extent technically practicable in the C Yard subsurface soils are identified in the following locations, 1) MW-4, SS-17, SS-18, which is southeast of tank 44, 2) SS-2, which is northwest of tank 44, 3) S-6, which is northwest of tank 37, 4) SS-2 and SS-13, which is between tanks 42 and 39, 5) S-5 and S-8, which is between tanks 35 and 37, 6) S-10, which is north of tank 35, 7) S-12, which is southwest of tank 35. (Figure 3). The total volume of the accessible TPH subsurface soil hot spots subject to excavation to the extent technically practicable in the Yard C is approximately 930 cubic yards.

Soil Excavation and Off-Site Disposal or Capping

Excavated TPH subsurface soil hot spots will be treated on/off site, and/or disposed at an approved disposal facility. Backfilling of subsurface soils will be comprised of clean fill material or treated material which will be tested before reuse on the site to ensure that it meets minimum requirements under the regulation for TPH. Excavation, disposal and back filling will be accomplished through the legal framework of the Consent Decree.

Excavation of the accessible TPH subsurface soil hot spots that are ongoing source to groundwater contamination will improve general groundwater conditions at the source,

enhance restoration time for the impacted areas and enhance biodegradation of the residual TPH in the subsurface. In addition, the groundwater-monitoring program will be implemented to monitor the ongoing intrinsic degradation/natural attenuation of the residual TPH in soils as part of the selected cleanup action. A deed restriction will also be implemented to prevent inappropriate future use of the site (Exhibit D).

Groundwater:

A Yard: Floating product was historically detected in groundwater sampling results at the following monitoring wells in the A Yard; A-3, A-10, A-14, A-15, A-19, A-20, A-21, A-26, A-27, and A-28.
Based on the groundwater sampling results of 1997 and 1998, floating product is detected in the following monitoring wells in the A Yard: A-4, A-6, A- 9, A-13, A-16, A-22 and A-29. Based on the current groundwater sampling results of 1998, dissolved TPH-G above the State Surface Water Standards and protective cleanup goals was detected at A-23 and A-28 in the, A Yard.

B Yard: Floating product was historically detected in groundwater sampling results at monitoring Well-9 in the B Yard. Based on the current groundwater sampling results of 1997 or 1998, floating product is detected at monitoring Wells 12 and 15 in the B Yard, while dissolved TPH-G above the State Surface Water Standards and protective cleanup goals was detected in only one well, MW-7, in the B Yard.

C Yard: Floating product was historically detected in groundwater sampling results at the following monitoring wells in the C Yard; Well-11, MW-4, Well-25, and T-10. Based on the current groundwater sampling results of 1997 (these wells were not sampled in 1998 sampling protocol), floating product is detected in the following monitoring wells in the, C Yard: Well 20, 21, 22, 25, and 27. Based on the current groundwater sampling results of 1998, dissolved TPH-G above the State Surface Water Standards and protective cleanup goals was detected at MW-3, Well-24, Well-25, T-5, T-18, and T-19 in the C Yard.

D Yard: Floating product was historically detected in groundwater sampling results at monitoring Well-17 in the D Yard. Based on the current groundwater sampling results of 1998, dissolved TPH-G above the State Surface Water Standards and protective cleanup goals was detected at MW-14, Well-17, T-13, T-15 and T-17 in the D Yard.

Floating Product Recovery

A pilot study may be necessary to define effective cone of influence, final design configuration, specifications, and justifications to remove floating product from Yards A, B, and C. If one is determined to be necessary, the data will be presented in the Remedial Design phase for the GATX site.

Partially-Penetrating Vertical Barriers. The preferred remedial alternative for addressing separate-phase hydrocarbons identified in selected areas of the A Yard (Figure 1), is the use of partially penetrating down-gradient migration barriers coupled with extraction of the product as it collects against the barrier. This alternative provides positive control and capture of product, yet does not create new problems in dealing with the extraction, treatment, and disposal of groundwater. The partially penetrating barrier will be used to intercept product along dominant groundwater flow paths of the property boundary. In areas with localized product, point-source removal will be implemented with oil skimming alternatives.

By partially penetrating the upper aquifer on the down-gradient side of the free-product plume, the migration of free product will be stopped at the barrier. The particular construction technique(s) used to create the barrier will be selected based on site constraints in each location (depth to water, below-grade utilities, pipeline and tank locations, buildings, etc.).

In areas of shallower groundwater, a subsurface concrete wall or an impermeable membrane (e.g. high-density polyethylene) will be installed within a temporary trench. Product extraction piping will also be installed within the trench and then the trench will be backfilled. In areas of deeper groundwater, driven plastic or bentonite panels is more attractive as are several proprietary single-pass trenching/membrane placement/backfilling systems. With either of these construction techniques, product extraction piping will take the form of individual wells placed immediately upgradient of the barrier. Throughout the site, free product shall be removed from the water table to the maximum extent practicable when ever present. The final design configuration, specifications, and justifications for this partial penetrating barrier technology to address the separate-phase hydrocarbons identified in selected areas of the A and C Yards will be presented in the Remedial Design phase for the GATX site.

Active Point Source Product Extraction. In areas of the A, B, C and D Yards where product is localized, it will be removed through point-source extraction (Figure 1). An active product skimming technique will be selected for each particular location. In areas with low-density, low-viscosity product, a density-float will be used as the intake of an above-grade pneumatic pump for product extraction. For more viscous, higher density (closer to 1.0) product, or for product whose thickness has already been greatly reduced, a belt-based skimming system would be utilized. Such systems are able to reduce product thickness to less than 0.01 feet and are able to handle viscous product which would foul the intake of a density float system. The final design configuration, specifications, and justifications for the wells located in A, B, C, and D Yards to be used for the active point-source extraction technology to address the localized separate-phase hydrocarbons will be presented in the Remedial Design phase for the GATX site.

Passive Product Recovery. Passive product recovery will be performed at selected locations of the A, B, C, and D Yards where necessary until there is no evidence of measurable petroleum hydrocarbon sheen. Passive product recovery is intended to supplement the active product recovery system as needed. Throughout the site, free product shall be recovered from the water table whenever present to the maximum extent practicable.

Extraction & Treatment of Groundwater. Groundwater extraction may be evaluated as part of the product skimming system to depress the water table and accelerate product movement toward the extraction wells. During this active product recovery, or the point source extraction alternative selected for the A, B, C, and D Yards, petroleum hydrocarbons dissolved in groundwater are usually recovered during this process. If groundwater is generated, the recovered petroleum hydrocarbons in groundwater will be separated from the product through gravity separation and the water discharged to the King County sewer system under a King County discharge permit or disposed of at an approved facility. Additional treatment (carbon adsorption) will only be used if needed to meet discharge limits.

Air Sparging of Groundwater & Natural Biodegradation of Residual TPH in the Saturated Soil. Air Sparging is a proven technology for removing product from below the water table. The injection of air below the water level and into hydrocarbon-impacted soils accelerates the mobilization and recovery of the residual hydrocarbons. Therefore, the injection of air will elevate the oxygen levels (in this instance, dissolved oxygen) and will improve conditions for aerobic hydrocarbon degradation within the saturated zone. Additionally, the air sparging reduces dissolved-phase hydrocarbon concentrations as the volatile constituents are stripped from the groundwater and captured by the SVE system described above. A final design of a full-scale for this technology, coupled with dual-phase extraction technology systems, will meet the remedial objectives outlined in this proposed CAP for the site groundwater. A pilot study at the A, and C Yards may be necessary to define effective cone of influence, final design configuration, specifications, and justifications will be presented in the Remedial Design phase for the GATX site.

4.2 Other Controls.

Access Restrictions. The site is an active operating facility and has restricted access (fences, signs, work permit requirements) as part of standard operations. These restrictions are in place 24 hour/day and 7 days/week. The Access and Operating Procedures for the GATX site is contained in Exhibit C, of the Consent Decree.

Institutional Controls. Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the site. Such measures are required to assure continued protection of human health and the environment when a cleanup action results in residual concentrations of IHS that exceed MTCA Methods A or B cleanup levels and where conditional points of compliance are established. These institutional controls include placement of a deed restriction on the property use to industrial purposes or interfering with remedial actions implemented in this proposed CAP. A copy of a proposed Restrictive Covenant for the GATX site is contained in Exhibit D, of the Consent Decree.

Work Construction. Schedule to begin work under this proposed CAP and other construction activities for the Remedial Design are contained in Exhibit E, of the Consent Decree. Work construction at the GATX site will be conducted under a Health and Safety Plan prepared under WAC 173-340-810.

4.3 Contingency Plans.

A contingency plan serves as a "backup" remediation plan in the event that the Preferred Option fails or proves ineffective in a timely manner (5 years). A Contingency plan that contains conceptual engineering plan and design will be initiated and implemented within 30 days of meeting any of the following criteria;

- If the results of the groundwater monitoring program after implementing the Preferred Corrective Options indicate elevated IHS concentration above cleanup levels beyond the specified restoration time frame of 5 years,
- or contaminants attributed to the Terminal are identified in point of compliance wells located outside of the original plume boundary, indicating renewed contaminant migration,
- or the elevated plume concentrations are not decreasing at a sufficient rate to ensure that the cleanup levels for the site will be met in the time authorized in this CAP.

Inland Groundwater Contingency Plan for Property Boundary Shall Include:

- Use of extraction well points, source identification and removal (supplemented by treatment) to prevent adverse impacts to offsite properties.
- Expand hydraulic control to ensure removal of free product from the water table

This contingency plan shall be outlined in detail in the Groundwater Monitoring Program, Exhibit F, developed for the site.

4.4 Groundwater Compliance Monitoring.

The attached groundwater-monitoring plan, Exhibit F, is consistent with WAC 173-340-410 and includes protection monitoring, performance and confirmational monitoring. The overall objective of the compliance monitoring and sentry wells downgradient of the product and dissolved plumes and on the property boundaries is to provide both Ecology and GATX with early warning of potential contamination migration and basis for additional remedy through implementation of contingency plans, if necessary. The types of compliance monitoring to be conducted include the following:

Protection Monitoring to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of the cleanup action.

Performance Monitoring to confirm that the cleanup action has attained cleanup standards and other performance standards.

Confirmational Monitoring to confirm the long-term effectiveness of the cleanup action once cleanup actions and other performance standards has been attained.

Product Monitoring. Selected wells will be evaluated in the compliance groundwater-monitoring program to monitor for product thickness as part of the performance standard evaluation for the preferred remedial alternatives for the site. Throughout the site, free product shall be removed from the water table when ever present.

Points of Compliance:

Soil. The determination of adequate soil treatment will be based on the remedial action's ability to comply with the groundwater cleanup standards for the site, to meet performance standards designed to minimize human health or environmental exposure to soils above cleanup levels, and to provide practicable treatment of contaminated soils. Performance standards designed to minimize human and environmental exposure to soils above the cleanup levels set for the site shall include: a covenant on the property which limits the site to industrial use only and prohibits any activity which may interfere with the protectiveness of the remedial action.

Groundwater. The achievement of cleanup levels in groundwater shall be measured at points of performance and compliance located within the product plume area and at the downgradient edge of the property boundary. The wells at the downgradient edge of the site are considered conditional points of compliance wells. These points of compliance and performance shall consist of a network of monitoring wells located in the product plume area and on the downgradient property boundary. Other wells (sentry wells) situated off-site will also be used to document plume migration, performance standards, and to warn of any unanticipated change in off-site groundwater conditions. Exact location of these wells are identified in the Groundwater Compliance Monitoring Program, Exhibit F, for the site.

5.0 JUSTIFICATION FOR THE SELECTED REMEDIAL ACTION

The cleanup action, as proposed, is designed to accomplish the following requirements: protect human health and the environment; comply with cleanup standards per WAC 173-340-700; comply with applicable state and federal laws per WAC 173-340-710; provide compliance monitoring per WAC 173-340-410; use permanent solutions to the maximum extent practicable per WAC 173-340-360 (2), (3), (4), (5), (7), and (8); provide a reasonable time restoration per WAC 173-340-360 (6) and consider public concerns per WAC 173-340-600. The following sections discuss how the proposed cleanup action will meet these requirements.

Protection of Human Health and the Environment.

Removal of accessible TPH-impacted soil hot spots in the subsurface will protect the environment by expediting site restoration as groundwater is improved at the hot spot source. Removal or capping of lead and arsenic surface soils will protect the environment and human health by effectively eliminating the soil to air particulate pathway. Recovering product associated vapor and dissolved petroleum hydrocarbons in groundwater will protect human health and the environment by preventing migration to the surface water and adverse impacts to adjacent properties, protecting day workers from vapors, and expediting site restoration. The Compliance Monitoring Plan, Exhibit F, is an added protection to monitor if remedial action objectives are being met. If not, then Contingency Plans for the site will be triggered appropriately.

Comply with Cleanup Standards per WAC 173-340-700 through 760.

The overall goal of cleaning up groundwater for the protection of surface water quality will be met. Fate and transport modeling shows the inland in-situ bioremediation will act to destroy soil contaminants, which may act as an ongoing source of groundwater contamination. The goal of soil cleanup standards for petroleum hydrocarbons is to protect groundwater resources (surface water quality and associated ecosystem). While the numerical soil cleanup standards developed through the Matrix may not be reached throughout the site, the preferred alternative that include excavation of accessible TPH-impacted soil hot spots in the subsurface, active vapor extraction to address residual hydrocarbon in the saturated zone, and active and passive product recovery from the smear zone, will result in substantive compliance with the soil cleanup standards by reducing concentrations of contaminants in soils to levels that will support and maintain the attainment of groundwater quality standards.

Compliance with Applicable State and Federal Laws per WAC 173-340-710.

The preferred alternative meets all state and federal laws. All activities carried out to implement the preferred alternative will meet any laws requiring or authorizing local government permits or approval for the remedial action on the site.

Provide Compliance Monitoring per WAC 173-340-410.

The preferred alternative includes the provision for long-term monitoring to ensure that groundwater continues to meet cleanup standards after remedial actions have been completed. During the remedial actions, performance monitoring will be conducted to confirm that cleanup actions have attained cleanup standards and treatment goals. After remedial actions, performance monitoring will be conducted to confirm and ensure that cleanup actions have attained cleanup standards and performance standards. Protection monitoring will be used to ensure that human health and the environment are being adequately protected during construction and operation of the cleanup actions. The specifics and details of these monitoring activities, locations, number and type of analyses, frequency, duration, and contingency plans are described in the Compliance Groundwater Monitoring Plan for the site. Schedule for this activity is contained in Exhibit E, of the Consent Decree.

Use of Permanent Solutions to the Maximum Extent Practicable per WAC 173-340-360 (4), (5), (7), and (8).

The permanent solutions (excavation of accessible TPH soil hot spots in the subsurface to the extent technically practicable; capping of the lead and arsenic with 3 inches of asphalt or its equivalent of soil fixation with Portland-cement in the surface soil) will permanently and effectively remove the pathways of soil to air, infiltration and leaching into the groundwater and surface runoffs. Product recovery, groundwater treatment and reuse are permanent treatment technologies that will effectively improve groundwater quality.

Provide for a Reasonable Restoration Time Frame per WAC 173-340-360 (6).

In view of the TPH subsurface soil hot spots that generate dissolved petroleum hydrocarbons in the groundwater above cleanup standards, Ecology believes that natural attenuation alone will not be sufficient to provide a reasonable restoration time frame for the site.

The following alternatives will provide for a reasonable restoration time frame of 5 years for the site: natural attenuation with active excavation of accessible TPH subsurface soil hot spots (e.g., source control), excavation or capping of lead and arsenic in the surface soils and free

product removal. This 5 year restoration time frame for the site groundwater is protective of the surface water and its ecosystem (primary concern) and adjacent properties (secondary concerns). The projected 5 year restoration time frame is reasonable, and will allow for a meaningful statistical evaluation of compliance monitoring data.

For areas of the site that have free product, restoration time begins after free product is removed from the water table and excavation of accessible TPH soil hot spots has been performed.

If implementation of the Contingency Plan for the site is deemed necessary based on the results of the groundwater compliance monitoring and other performance standards, the restoration time clock for the site begins 30 days after implementation of the contingency plan. Where contingency plan implementation is not necessary, restoration time for the site is 5 years and the restoration clock begins 30 days after implementation of the Preferred Cleanup Action for the site. This is the time required to reduce residual TPH in the subsurface to reasonable levels and groundwater quality below state and federal standards and to collect meaningful statistical data to evaluate groundwater compliance with remedial objectives.

Other specific time lines are outline in the Schedule, Exhibit E, and is further detailed in the Compliance Groundwater Monitoring Program, Exhibit F, for the GATX Site.

Consider Public Concerns per WAC 173-340-600.

The public is given the opportunity to comment on this CAP during a 30-day public comment period. upon completion of remedial milestones in the cleanup process. This review will include the following additional documents: the Consent Decree, Covenants and Restrictions, Compliance Monitoring Plan, and Project Schedule. The Remedial Design may be subject to a separate public comment period in the future. Ecology will consider all comments received. At the end of the comment period, Ecology will prepare a responsiveness summary listing each comment received and Ecology's response to the comment.

6.0 IMPLEMENTATION SCHEDULE

Exhibit E, of the Consent Decree contains an outline of the schedule for the cleanup activities. The Consent Decree will become effective once signed by the Court. As outlined in the schedule, specifics on detailed analysis may be needed to complete the remedial design. Ecology has review and approval authority for these documents and the public will have an opportunity to participate in each milestone requiring public comment through the 30-day public period.

7.0 REFERENCES

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FIGURES